

REMARKS

The Office Action dated March 31, 2003 has been received and carefully noted. The above amendments and the following remarks are submitted as a full and complete response thereto. By this Amendment, claims 4 and 9 have been cancelled and claims 1, 6, 7, 11 and 14 have been amended to more particularly point out and distinctly claim the invention. No new matter has been added. Accordingly, claims 1, 2, 5-8 and 11-15 are pending in this application and are submitted for consideration.

The title of the invention was objected to as not being descriptive. Also, claims 1 and 14 were objected to for certain informalities. By this amendment, the title has been amended and claims 1 and 14 have been amended to correct the informalities. Therefore, the Applicant requests that the objections be withdrawn.

Claims 1, 4-7 and 9 were rejected under 35 U.S.C. § 102(b) as being anticipated by Matsuda et al. (U.S. Patent No. 4,629,882, "Matsuda"). Claims 4 and 9 have been cancelled, thereby rendering the rejection with respect to these claims moot. However, Applicant respectfully submits that claims 1 and 5-7 recite subject matter that is neither disclosed nor suggested in Matsuda.

Applicant's amended independent claim 1 recites a photosensor-amplifier device comprising, a photoelectric conversion element that converts an optical signal into an electric signal. A first electrode is connected electrically to the photoelectric conversion element and by which the electric signal is extracted from the photoelectric conversion element. A second electrode is formed on the photoelectric conversion element in close proximity to the first electrode in such a way that the electric signal does not pass

through the second electrode. Included is an amplifier circuit that has a first input terminal and a second input terminal and that amplifies and then outputs a difference between electric signals fed to the first and second input terminals and a first bonding wire connects the first electrode to the first input terminal. A second bonding wire having substantially an identical length as the first bonding wire and is laid side-by-side substantially parallel to the first bonding wire. The second bonding wire connects the second electrode to the second input terminal. Each of the first electrode, the second electrode, the first input terminal, and the second input terminal are arranged in a substantially rectangular shape in plan view such that the first and second bonding wires receive electromagnetic noise in substantially equal degrees so that noise signals induced in the first and second bonding wires are made substantially equal to each other.

In making this rejection, the Office Action took the position that Matsuda discloses all of the elements of the claimed invention. However, it is respectfully submitted that the prior art fails to disclose or suggest the structure of the claimed invention, and therefore, fails to provide the advantages of the present invention. For example, the photosensor-amplifier of the present invention is configured to such that each of the first electrode, the second electrode, the first input terminal, and the second input terminal are arranged in a substantially rectangular shape in plan view such that the first and second bonding wires receive electromagnetic noise in substantially equal degrees so that noise signals induced in the first and second bonding wires are made substantially equal to each other.

As a result of the claimed configuration, noise signals cancel each other more fully in the operational amplifier circuit and thus, the noise signal induced in the first wire can be reduced more effectively.

With respect to claim 1, the Office Action asserted Fig. 4 of Matsuda teaches a photoelectric conversion element 20, a first electrode 30a connected electrically to the photoelectric conversion element and by which the electric signal is extracted from the photoelectric conversion element, a second electrode 30c formed on the photoelectric conversion element in close proximity to the first electrode in such a way that the electric signal (out of 30a) does not pass through the second electrode, an amplifier circuit 52 (col. 6, lines 23-29) with a first input terminal 32a and a second input terminal 32c and amplifying and outputting a difference between electric signals fed to the first and second input terminals.

However, Applicant submits that the first and second input terminals 32a, 32c of Matsuda are not input terminals of the amplifier circuit 52. The first and second input terminals 32a, 32c are, according to Matsuda, terminals provided in a ceramic substrate 34 (col. 5, lines 31-50). Matsuda does not mention that the terminals 32a, 32c are the input terminals of the amplifier circuit 52 or of any other circuit. According to the structure shown in the drawing and description, it appears that terminals 32a, 32c are output terminals of a light receiving element 20. Therefore, Matsuda fails to disclose or suggest an amplifier circuit having first and second input terminals, as recited in claim 1.

The Office Action also asserted that Matsuda discloses a first bonding wire 26a (Figs. 3a and 3b) connecting the first electrode to the first input terminal, and a second

bonding wire 26c having substantially identical length as the first bonding wire, and laid substantially parallel to the first bonding wire, connecting the second electrode to the second input terminal.

However, contrary to the claimed invention, in Figs. 3a and 3b of Matsuda, the first and second bonding wires are so laid that the two wires are aligned in a straight line. Therefore, the layout of Matsuda does not permit the first and second bonding wires to receive electromagnetic noise in substantially equal degrees so as to make noise signals induced in these wires from the electromagnetic noise substantially equal to each other, as also recited in amended claim 1.

Regarding claim 6, the Office Action asserted that Matsuda teaches the photoelectric conversion element including a photodiode (col. 4, lines 28-33) comprised of joining an N-type semiconductor 22 and a P-type semiconductor 24 together and a diode comprised of joining an N-type semiconductor 22 and a P-type semiconductor 26 together and shielded from light (col. 5, lines 31-37), and the first electrode is connected electrically to one end of the photodiode, and the second electrode is connected to one end of the diode (Fig. 3b).

Upon further review of Matsuda, it appears that the Office Action is taking the position that an electrode formed on the P-type semiconductor 24 is the first electrode connected to the photodiode, and an electrode formed on the P-type semiconductor 26 is the second electrode connected to the diode. However, according to the rejection of claim 1, from which claim 6 is dependent, the second electrode of Matsuda in Figs. 3a, 3b and 4 is element 30c. Thus, if the second electrode is 30c, the second electrode is

not connected to one end of the diode comprised of joining the N-type semiconductor 22 and the P-type semiconductor 26 together and shielded from light, as recited in claim 6.

Therefore, it is respectfully submitted that the Applicant's invention, as set forth in claim 1, is not anticipated within the meaning of 35 U.S.C. § 102.

As claims 5-7 depend directly or indirectly from claim 1, Applicant respectfully submits that each of these claims incorporates the patentable aspects thereof, and are therefore allowable for at least the same reasons as discussed above with respect to the independent claim.

Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Matsuda in view of Sawada et al. (U.S. Patent No. 5,652,425 "Sawada"). In making this rejection, the Office Action took the position that Matsuda discloses all the elements of the claimed invention, except for disclosing identical bias voltages applied to the first and second input terminals. Sawada is cited for teaching this limitation. However, the Applicant respectfully submits that claim 2 is neither disclosed nor suggested in any combination of the prior art.

The Office Action asserted that it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply identical bias voltages to the first and second input terminals as taught by Sawada in the device of Matsuda to provide identical noise signals into both input terminals of the amplifier to remove the noise component of the photodetection signal as taught by Sawada.

As discussed above, Matusuda fails to disclose or suggest the claimed invention. Sawada fails to cure the deficiencies of Matsuda. Fig. 1 of Sawada teaches a photosensor-amplifier device comprising a photoelectric conversion element (1, 5) and amplifier circuit (600) (Fig. 3) with a first input terminal (Vin1) and a second input terminal (Vin2) wherein identical bias voltages (V_{PD}) are applied to the first and second input terminals (Fig. 1).

However, as shown in Fig. 1 of Sawada, the bias voltage V_{PD} is applied to a cathode 1a of photodiode 1 and one electrode 5a of a capacitor 5 and therefore, the bias voltage is not applied to the first and second input terminals, as recited in claim

Therefore, Applicant submits that Matsuda and Sawada, either alone or in combination, fail to disclose or suggest the present invention.

As claim 2 depends directly from claim 1, Applicant respectfully submits that claim 2 incorporates the patentable aspects thereof, and is therefore allowable for at least the same reasons as discussed above.

Therefore, it is respectfully submitted that the Applicant's invention, as set forth in claim 2, is not obvious within the meaning of 35 U.S.C. § 103.

Claim 8 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Matsuda. In making this rejection, the Office Action took the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a first and second bonding process in the device of Matsuda to customize the photosensor-amplifier device with specific amplification characteristics during the production process.

As discussed above, Matusuda fails to disclose or suggest the claimed invention. Furthermore, the Office Action has not shown explicitly or implicitly in Matsuda where the limitation of claim 8 is taught, nor has the Office Action asserted that the knowledge is generally available to one of ordinary skill in the art, as required by MPEP § 2413.01. Therefore, it is submitted that this is impermissible hindsight because the only reason for the proposed modification is gleaned from the Applicant's specification.

Additionally, because claim 8 depends either directly or indirectly from claim 1, Applicant respectfully submits that this claim incorporates the patentable aspects of claim 1, and is therefore allowable, for at least the same reasons.

Thus, it is respectfully submitted that the Applicant's invention, as set forth in claim 8 is not obvious within the meaning of 35 U.S.C. § 103.

Claims 11 and 13-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Matsuda in view of Nishiyama (U.S. Patent No. 5,610,395, "Nishiyama"). In making this rejection, the Office Action took the position that Matsuda discloses all the elements of the claimed invention, except for disclosing the amplifier circuit on a second chip. Nishiyama is cited for teaching this limitation.

As will be discussed below, Applicant respectfully submits that claims 11 and 13-15 recite subject matter that is neither disclosed nor suggested by any combination of the prior art.

Applicant's independent claim 11 recites a photosensor-amplifier device including a first chip having a photoelectric conversion element that converts an optical signal into an electric signal. A first electrode formed on the first chip and connected electrically to

the photoelectric conversion element. A second electrode is formed on the first chip so as to be located in close proximity to the first electrode, a second chip having an amplifier circuit for amplifying and outputting a difference between electric signals fed thereto. A first input terminal is formed on the second chip and connected electrically to one input portion of the amplifier circuit. A second input terminal is formed on the second chip so as to be located in close proximity to the first input terminal and connected electrically to another input portion of the amplifier circuit, a first bonding wire connecting the first electrode to the first input terminal, and a second bonding wire having substantially an identical length as the first bonding wire and laid substantially parallel thereto, the second bonding wire connecting the second electrode to the second input terminal. Identical bias voltages are applied to the first and second input terminals. Each of the first electrode, the second electrode, the first input terminal, and the second input terminal are arranged in a substantially rectangular shape in plan view such that the first and second bonding wires receive electromagnetic noise in substantially equal degrees so that noise signals induced in the first and second bonding wires are made substantially equal to each other.

Regarding claim 11, the Office Action took the position that Matsuda discloses a first bonding wire 26a (Figs. 3a and 3b) connecting the first electrode to the first input terminal, and a second bonding wire 26c having substantially identical length as, and laid substantially parallel to, the first bonding wire, connecting the second electrode to the second input terminal. However, as discussed above with respect to the rejection of claim 1, contrary to the present invention, in Figs. 3a and 3b of Matsuda, the first and

second bonding wires are so laid that the two wires are aligned in a straight line. Furthermore, the layout of Matsuda does not permit the first and second bonding wires to receive electromagnetic noise to nearly equal degrees so as to make noise signals induced in these wires from the electromagnetic noise nearly equal to each other, as also claimed in amended claim 11.

~~The Office Action asserted that it would have been obvious to one of ordinary skill~~
in the art at the time the invention was made to use a second chip to contain the amplifier circuit as taught by Nishiyama in the device of Matsuda to provide a modular design to enable simple removal and replacement of each chip for upgrade or repair purposes. However, Nishiyama fails to cure the deficiencies of Matsuda.

Therefore, Applicant submits that claim 11 recites subject matter that is neither disclosed nor suggested in the prior art.

With respect to claim 13, the Office Action further took the position that Matsuda teaches the first chip including a first region (around and below 30c) formed in a top portion of a semiconductor substrate 22 of one conductivity type (n-type) (col. 5, lines 9-11) by joining a semiconductor 26 of another conductivity type (p-type) (col. 5, lines 11-15, a second region (region of 26 and under 26, sufficiently smaller than the first region, formed in the top portion of the identical semiconductor substrate by joining the semiconductor 24 of another conductivity type, and an insulating film 28 (col. 5, lines 18-21) coating a top surface of the first chip, a photodiode formed by removing a part 28c of the insulating film that coats the first region and by forming the first electrode so as to make contact with the first region, a dummy photodiode shielded from light formed by

removing a part 28a of the insulating film that coats the second region and by forming the second electrode in such a way that the second electrode makes contact with the second region through the removed part of the insulating film and the second electrode 30a covers all of a top portion 26 of the second region.

The Office Action took the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a second chip to contain the amplifier circuit as taught by Nishiyama in the device of Matsuda to provide a modular design to enable simple removal and replacement of each chip for upgrade or repair purposes.

However, in the present invention, the first chip includes a first region formed, in a top portion of a semiconductor substrate of one conductivity type, by joining a semiconductor of another conductivity type; a second region, sufficiently smaller than the first region, formed in the top portion of the identical semiconductor substrate by joining the semiconductor of another conductivity type; and an insulating film coating a top surface of the first chip, a photodiode is formed by removing a part of the insulating film that coats the first region and by forming the first electrode so as to make contact with the first region, a dummy photodiode shielded from light is formed by removing a part of the insulating film that coats the second region and by forming the second electrode in such a way that the second electrode makes contact with the second region through the removed part of the insulating film and the second electrode covers all of a top portion of the second region.

Therefore, Applicant submits that claim 13 recites subject matter that is neither disclosed nor suggested in the prior art.

Regarding claim 15, the Office Action admitted that Matsuda and Nishiyama do not teach a first bonding operation for bonding the first and second element and a second bonding operation for bonding the first and second conductor pattern, respectively. However, the Office Action asserted that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a first and second bonding process in the device of Matsuda in view of Nishiyama to customize the photosensor-amplifier device with specific amplification characteristics during the production process. However, as discussed above, Matsuda and Nishiyama fail to disclose or suggest the claimed invention. Furthermore, the Office Action asserted that it is well known in the art to use separate bonding processes for bonding wires to provide the ability to interchange parts before the final bonding process. However, the Office Action has not shown explicitly or implicitly in the references where the limitation of claim 15 is taught, as required by MPEP § 2413.01. Therefore, it is submitted that this is impermissible hindsight because the only reason for the proposed modification is gleaned from the Applicant's specification.

Additionally, the Office Action asserted that it is well known in the art to use separate bonding processes for bonding wires in order to provide the ability to interchange parts before the final bonding process. However, the Office Action did not provide any support for this position. Therefore, the Applicant seasonably challenges this assertion, according to MPEP § 2144.01.

Accordingly, it is respectfully submitted that the Applicant's invention, as set forth in claims 11, is not obvious within the meaning of 35 U.S.C. § 103.

Still further, because claims 13 and 14 are dependent on claim 11, Applicant submits that these claims recite subject matter that is neither disclosed nor suggested by the cited prior art for at least the reasons set forth above with respect to claim 11.

~~Claim 12 was rejected under 35 U.S.C. § 103(a) as being unpatentable over~~
Matsuda in view of Nishiyama and further in view of Sawada. In making this rejection, the Office Action took the position that Matsuda in combination with Nishiyama teaches all the elements of the claimed invention, except that the second electrode is electrically open. Sawada is cited for curing this deficiency.

The Office Action asserted that the second electrode of Matsuda is 30c. Matsuda explicitly describes that electrode 30c is electrically connected with n-type plate 22 (col. 5, lines 26-30). Thus, the device of Matsuda functions as intended if the electrode 30c is electrically connected with n-type plate 22. Therefore, one of ordinary skill in the art would not be compelled to use an electrically open second electrode in the device of Matsuda.

The Office Action further took the position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an electrically open second electrode as taught by Sawada in the device of Matsuda in view of Nishiyama to provide a base signal in which to provide cancellation of electromagnetic noise.

However, as discussed above, Applicant submits that Matsuda, Nishiyama and ~~Sawada, either alone or in combination, fail to disclose or suggest the present invention.~~

Therefore, it is respectfully submitted that the Applicant's invention, as set forth in claim 12 is not obvious within the meaning of 35 U.S.C. § 103.

Still further, because claim 12 is dependent on claim 11, Applicant submits that this claim recites subject matter that is neither disclosed nor suggested by the cited prior art for at least the reasons set forth above with respect to claim 11.

~~In view of the foregoing, reconsideration of the application, withdrawal of the~~
outstanding rejections, allowance of claims 1, 2, 5-8 and 11-15, and the prompt issuance of a Notice of Allowability are respectfully solicited.


If this application is not in condition for allowance, the Examiner is requested to contact the undersigned at the telephone listed below.

In the event this paper is not considered to be timely filed, the Applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, **referencing docket number 103213-00020.**

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Respectfully submitted,
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